~~APPARATUS AND METHOD FOR ALIGNING AN ITEM THAT CAN BE DEFORMED EASILY, AT LEAST IN THE REGION OF THE OUTER LOWER EDGE, ON A TRANSPORT SUBSTRATE~~ ALIGNING A STACK ON A PALLET OR THE LIKE

CROSS REFERENCE TO RELATED APPLICATIONS

This application is the US national phase of PCT application PCT/EP2005/001630, filed 17 February 2005, published 01 September 2005 as WO 2005/080243, and claiming the priority of German patent application 202004003136.1 itself filed 17 February 2004 and German patent application 202004002488.8 itself filed 17 February 2004, whose entire disclosures are herewith incorporated by reference.

FIELD OF THE INVENTION

The invention relates to an apparatus for aligning an item that can be deformed easily, at least in the region of [[the]] its outer lower edge, such as a stack of items comprising in particular flat structures made of a flexible material, such as sheets of paper or the like, on a transport substrate, such as a pallet, at least one aligning device that can be displaced in the direction of the item stack and the transport substrate being provided to align the item stack on the transport substrate.

BACKGROUND OF THE INVENTION

Apparatuses of this type are used in practice in order, for example, to align the item stack ~~in relation~~ relative to the transport substrate before the packaging operation and after the loading operation.

Alignment is necessary in order that the item stack is ~~arranged~~ oriented within the ~~contour~~ footprint of the transport substrate since regions of the item stack projecting beyond the ~~contour~~ footprint can be damaged during subsequent transport, for example by adjacent pallets.

Known aligning devices comprise two continuous displaceable walls~~, which~~ that ~~are assigned to~~ confront each other horizontally or vertically and ~~which~~ that in each case are moved in parallel or together ~~in the direction of~~ toward the item stack and in this way the item stack is aligned ~~in relation~~ relative to the transport substrate.

The alignment of flat structures in particular, such as stacks of paper sheets, proves to be problematical. For example, when paper is being cut to size, cross-cutters are used, as a result of [[the]] which the paper stack may not be positioned centrally on the transport substrate but instead may project by up to 40 mm on the longitudinal side and/or the transverse side of the transport substrate. Since paper can be damaged very easily in the region of ~~the projection~~ such a projecting portion during transport, alignment is required, in particular under all circumstances in the case of stacks of paper.

Previously known mechanical devices cannot be used since, during [[the]] alignment with these devices, the lower edges are bent downward as a result of the force of the alignment device and can be clamped [[in]] between the transport substrate and the aligning device. Apart from the fact that the bent-down

sheets can no longer be used, the bent-down sheets also prevent further displacement, so that satisfactory alignment is not possible. Given a lack of technical solutions, the stacks of paper are therefore aligned by hand. Here, in the region of the ~~projection~~ projecting portion, the transport substrate is moved into the desired position by means of specific blows.

OBJECTS OF THE INVENTION

It is therefore an object of the invention to improve a known apparatus in such a way that an item stack projecting laterally beyond the outer ~~contour~~ footprint of a transport substrate can be moved mechanically into the ~~contour~~ footprint of the transport substrate and damage to the item stack during alignment can be avoided.

Another objects of the invention is to provide an improved method of aligning an item stack on a substrate, for example a stack of paper sheets on a pallet.

SUMMARY OF THE INVENTION

This object is achieved in that at least the ~~subregion~~ portion of at least one aligning device [[which]] that comes into contact with the lower region of the item projecting laterally beyond the outer ~~contour~~ footprint of the transport substrate during the alignment of the item stack on the transport substrate is ~~assigned~~ provided with a stabilizing device [[which]] that prevents the item stack from being deflected ~~in the direction of~~ toward the transport substrate.

During [[the]] displacement of the item stack, if the latter is formed as a stack of paper, the stabilizing device in particular prevents the lower sheets from bending over downward and being turned [[over]] under, and in this way the item stack can be pushed at least sufficiently far that it terminates flush with the ~~contour~~ footprint of the transport substrate. The aligning device can be formed, for example, as a displaceable wall. However, it is also entirely possible for appropriate displaceable walls to be provided on two opposite sides, between which the item stack is aligned.

The stabilizing device can include a layer ~~which~~ that inhibits slipping. In this way, [[the]] friction between the aligning device and the item stack is increased, so that slippage of the item stack, in particular when this is a stack of paper, ~~in the region of~~ where the edge is in contact with the aligning device is prevented.

It is recommended that the stabilizing device includes a ~~compliant~~ resilient element. This has the effect that, during displacement, the ~~compliant~~ resilient element bears from below on the lower edge of the item stack and in the process exerts a supporting force on the item stack such that bending over or turning [[over]] under of the lower region of the item stack is prevented.

The element can be made of rubber, for example, such as foam rubber or cellular rubber.

Other embodiments of a stabilizing device are possible. For example, the stabilizing device can comprise a supporting device for supporting the item stack. This can be, for example, an angle integrally molded on the aligning device~~, which~~ and that can be used when transport substrates of a defined height are employed. This angle supports the item stack on the underside.

In another embodiment, the stabilizing device can have a supporting surface adjoining the contact surface of the transport substrate laterally at a short distance, at least during the alignment, and at least approximately aligned with the contact surface. This supporting surface can be moved into its operating position, for example by moving ~~in the direction of~~ toward the transport substrate or by pivoting. The height of the supporting surfaces can preferably be varied, so that transport substrates of different heights can also be employed. In the operating position of the supporting surface, the aligning device which [[,]] for example [[,]] is formed as a displaceable wall, is moved through a short distance along the upper side of the supporting surface ~~at a short distance,~~ so that when the aligning device is displaced ~~in the direction of~~ toward the item stack, the item stack is displaced and the lower flat structures of the item stack are protected by the supporting surfaces ~~against~~ from being bent [[over]] under.

The aligning devices can be formed in one piece. However, it is also entirely possible for the aligning devices to

be formed ~~in many~~ of several parts, at least in an upper and a lower segment, ~~in relation~~ relative to the height of the item stack, and the stabilizing device can be provided at least on the lower segment.

In this case, it is recommended that the adjacent edges have mutually at least approximately ~~corresponding~~ complementarily curved edges ~~curves~~ with projecting and set-back ~~subregion~~ portions, in particular ~~are formed~~ in the shape of [[a]] interengaging waves ~~and interengaging~~. If the aligning device is formed in two parts, it is recommended [[for]] that the stabilizing device, if it includes a ~~compliant~~ resilient element, [[to]] be provided at least in the lower ~~segment~~ region. In this case, it is recommended for the upper ~~segment~~ region to be capable of being moved further inward toward ~~onward in the direction of~~ the item stack at least by the thickness of the ~~compliant~~ resilient element in the compressed state, in order to prevent the formation of an edge offset in the region of the item stack.

The height of at least one aligning device is matched to the upper edge of the transport substrate in such a way that movement beyond the edge of the transport substrate is possible. This makes it possible for the item stack to be displaceable beyond the edge on the transport substrate.

The invention also relates to a method for aligning an items that can be deformed easily, at least in the region of the outer lower edge, such as a stack of items comprising in

particular flat structures made of a flexible material, such as paper sheets or the like, on a transport substrate, such as a pallet, at least one aligning device that can be displaced ~~in the direction of~~ toward the item stack and the transport substrate being provided to align the item stack on the transport substrate.

Alignment methods are carried out in practice in order, for example, to align the item stack ~~in relation~~ relative to the transport substrate before the packaging operation and after the loading operation.

Alignment is necessary in order that the item stack is ~~arranged~~ positioned within the ~~contour~~ footprint of the transport substrate since regions of the item stack projecting beyond the ~~contour~~ footprint can be damaged during subsequent transport, for example by adjacent pallets.

In known alignment methods, aligning devices are used ~~which~~ that comprise two continuous displaceable walls~~, which~~ that ~~are assigned~~ confront to each other horizontally or vertically and ~~which~~ that in each case are moved in parallel or together ~~in the direction of~~ toward the item stack and in this way the item stack is aligned ~~in relation~~ relative to the transport substrate.

~~The alignment of flat structures in particular, such as stacks of paper, proves to be problematical. For example, when paper is cut to size, crosscutters are used, as a result of which the paper stack may not be positioned centrally on the transport substrate but instead may project by up to 40 mm on the~~

~~longitudinal side and/or the transverse side of the transport substrate. Since paper can be damaged very easily in the region of the projection during transport, alignment is required in particular under all circumstances in the case of stacks of paper.~~

~~Previously known mechanical devices cannot be used since, during the alignment with these devices, the lower edges are bent downward as a result of the force of the alignment device and can be clamped in between the transport substrate and the aligning device. Apart from the fact that the bent-down sheets can no longer be used, the bent-down sheets also prevent further displacement, so that satisfactory alignment is not possible. Given a lack of technical solutions, the stacks of paper are therefore aligned by hand. Here, in the region of the projection, the transport substrate is moved into the desired position by means of specific blows.~~

~~It is therefore an object of the invention to specify a method with which an item stack projecting laterally beyond the outer contour of a transport substrate can be moved mechanically into the contour of the transport substrate and damage to the item during alignment can be avoided.~~

~~This object is achieved in that a~~ <u>According to the method of the invention</u> downward deflection of the lower region of the item projecting laterally beyond the ~~outer contour~~ <u>footprint</u> of the transport substrate is prevented by a stabilizing device [[which]] <u>that</u> is ~~assigned to~~ <u>provided with</u> at

least the ~~subregion~~ portion of the aligning device [[which]] that comes into contact with the region of the item projecting laterally beyond the ~~outer contour~~ footprint of the transport substrate during [[the]] alignment of the item stack on the transport substrate. During [[the]] displacement of the item stack, if the latter is formed as a stack of paper sheets, the use of the stabilizing device in particular prevents the lower sheets bending over downward and being turned [[over]] under. In this way the item stack can be pushed at least sufficiently far that it terminates flush with the ~~contour~~ footprint of the transport substrate. The aligning device(s) can be formed, for example, as a displaceable wall. However, it is also entirely possible for appropriate displaceable walls to be provided on two opposite sides, between which the item is aligned.

~~In this case,~~ Thus before [[the]] alignment of the item stack on the transport substrate, the transport substrate can for its part be aligned ~~in relation~~ relative to at least one aligning device. For this purpose, use can be made for example of ~~stoppers~~ abutments~~, which~~ that are preferably arranged transversely with respect to the ~~conveying~~ travel direction and are moved against the transport substrate. As a result, the transport substrate is aligned parallel with the ~~conveying~~ travel direction.

~~In order to reduce friction between the underside of the item and the contact surface of the transport substrate, a~~

~~friction-reducing layer can be provided. In this way, the item can be displaced more easily on the transport substrate.~~

A thin sheet can be laid on the transport substrate as a layer before the loading of the transport substrate with the item stack. In another embodiment, a film, in particular an oil film, can be applied to the underside of the item stack as a layer.

BRIEF DESCRIPTION OF THE DRAWING

In the following text, an illustrated embodiment of the invention illustrated in the drawings will be explained. In the drawings:

FIG. 1 [[shows]] is a side view of an apparatus according to the invention,

FIG. 2 [[shows]] is a plan view of the subject according to FIG. 1,

FIG. 3 [[shows]] is the detail "X" from FIG. 1, and

FIG. 4 [[shows]] is a ~~plan of~~ section through part of a multi-part aligning device.

SPECIFIC DESCRIPTION

In all the figures, the same designations are used for the same or identical components.

In FIGS. 1 and 2, a transport substrate 1 formed as a pallet is illustrated ~~, on which an~~ carrying a stack of items ~~2 is stacked~~. [[The]] Each item of the stack 2 has previously been placed on the transport substrate 1 by an unillustrated loading device ~~, not illustrated and connected~~ upstream of the aligning

operation. The items are [[2 is]] flat ~~structures~~, such as sheets of paper~~, which~~ that are stacked on one another and, in the illustrated embodiment ~~illustrated~~, project beyond the transport substrate 1 on the left-hand side.

On the underside, the transport substrate 1 ~~stands~~ rests on a roller conveyor 3. By means of this roller conveyor 3, the transport substrate 1 with the item stack 2 located on it is, for example, moved from a loading device to the apparatus according to the invention, the transport substrate 1 having been previously [[being]] aligned with respect to the roller conveyor 3 in order that the transport substrate 1 is aligned parallel to the ~~conveying device~~ travel direction 4. For this purpose, for example, ~~stoppers~~ abutments arranged transversely with respect to the ~~conveying device~~ travel direction 4 and against which the transport substrate 1 is moved can be provided in the roller conveyor 3.

In order to align the item stack 2, the apparatus, as illustrated in FIGS. 1 and 2, has an aligning device 5 on both sides of the roller conveyor 3, each aligning device 5 being formed as a displaceable wall ~~which is~~ aligned parallel with the ~~conveying~~ travel direction 4. The aligning devices 5 can be moved toward the item stack 2 in the direction of the arrows 6. They can be driven individually or together.

In the ~~illustrated~~ embodiment illustrated in FIG. 3, a wooden board 7 is provided on the side of the aligning device 5 facing the item stack 2. On the side of the wooden board 7

itself facing the item stack 2 there is in turn fitted a stabilizing device 8 ~~which~~ that, in the illustrated embodiment illustrated, includes a ~~compliant~~ resilient element.

The aligning devices 5 are held in a supporting construction 10 by roller arrangements 9. During alignment, first of all the left-hand aligning device 5 illustrated in FIG. 1 meets the item stack 2. In the process, the ~~compliant~~ resilient material is compressed, the ~~compliant~~ resilient material bearing on the lower edge 11 of the item stack 2 and ~~developing~~ applying a ~~supporting~~ force in the direction of the arrow 12 and in this way preventing the lower paper layers from bending [[over]] or turning over. During further displacement in the direction of the transverse arrow 6, each stabilizing device 8 comes into contact with the transport substrate 1 with ~~the region on the underside projecting~~ its lower end that projects downward beyond the item stack 2. Because of the ~~compliance~~ resilience of the stabilizing device 8, however, the displacement movement can be continued until the outer edge of the item stack 2 ~~terminates~~ is flush with the outer edge of the transport substrate 1.

For the case in which alignment and thus movement of the item stack 2 inward beyond the ~~contour~~ footprint of the transport substrate 1 is desired, the aligning devices 5 have to be matched to the height of the transport substrate 1 in such a way that the aligning devices 5 in the lower region can ~~be moved~~ move inward over the upper edge of the transport substrate 1.

The ~~compliant~~ resilient material used can be, for example, a foam rubber or a closed-cell, resilient cellular rubber having cell sizes of 0.2 to 0.5 mm. In this case, the surface of the material coming into contact with the item stack 2 is preferably ~~formed so as to be~~ closed, so that air escaping during compression must necessarily emerge via the [[front]] side edges ~~, of which the~~ whose areas [[is]] are smaller.

In the ~~illustrated~~ embodiment illustrated in FIGS. 1 and 2, the item stack 2 is aligned ~~in the region of~~ at the longitudinal edges. If alignment ~~in the region of~~ at the shorter [[side]] transverse edges is desired, aligning devices 5 must likewise be provided in these regions. In the rest position, the aligning devices 5 are located completely out of the active range of the roller conveyor 3. For [[the]] alignment, the aligning devices 5 are moved orthogonally with respect to the ~~conveying~~ travel direction 4 until in the desired position.

In FIGS. 1 to 3, the aligning devices 5 are formed in one piece. FIG. 4 shows a divided aligning device 5 [[which]] that is divided into an upper and [[a]] lower segments 13 [[,]] and 14. In this case, the adjacent edges 15 [[,]] and 16 have mutually at least approximately ~~corresponding~~ complementary edge curves with projecting and set-back ~~subregion~~ portions. In the illustrated embodiment illustrated, the edges 15 [[,]] and 16 are formed in the shape of waves. The stabilizing device 8 including the ~~compliant~~ resilient element is in this case ~~provided on~~ the lower segment 14.

The upper segment 13 is preferably moved further ~~in the duration of~~ toward the item stack 2 by the thickness of the stabilizing device 8 in the compressed state. In conjunction with the interengaging edge curves, an offset ~~within~~ inward of the side edge of the item stack 2 can thus be avoided.

In order to reduce [[the]] friction between the item stack 2 and the transport substrate 1, a friction-reducing layer can be provided. For example, the lowest layer of paper [[layer]] can be oiled. However, it is also entirely possible to provide a thin sheet between the transport substrate 1 and the lowest paper underlayer, the thin sheet preferably having a low coefficient of friction.

The provision of a thin sheet proves to be advantageous in ~~as much as~~ that a thin sheet cover subsequently drawn over the item stack 2 following the alignment can be welded to the thin sheet and in this way the item stack 2 is protected against moisture.